

REMARKS

The present response is intended to be a full and complete response to the non-final Office Action mailed July 9, 2008. Claims 16 to 17, 19 to 22, 24 to 28 and 30 to 31 are pending in the present application. Applicants respectfully request continued examination of the present application and allowance of the pending claims.

Amendments to the Claims:

Claims 26 and 27 have been amended to indicate that in the CO₂/He mixture (claim 26) and the CO₂/H₂ mixture (claim 27), the CO₂ content is between about 30% to about 80%. Support for this amendment may be found on page 5, lines 1 to 4 of the application. Claim 29 has also been cancelled. Claim 30 has been amended in order to address the § 112 issue and also to include NO₂ which was inadvertently left out when claim 30 was added in the previous response to office action. Support for this amendment may be found in previous claim 23 which was incorporated into new claim 30. Claim 31 has also been amended to include NO₂ which was inadvertently left out when claim 31 was added in the previous response. Support for this amendment may also be found in previous claim 23 which was incorporated into new claim 31.

35 U.S.C. § 112 Rejection

The Examiner rejects Claim 30 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner states that the phrase "group comprising" renders the scope of the claim unclear.

In view of the Examiner's rejection, claim 30 has been amended in order to clarify that the infrared radiation absorbing gases are selected from saturated hydrocarbons, unsaturated hydrocarbons, CO₂, CO, H₂O, NH₃, NO, N₂O, NO₂ and mixtures thereof. In view of this amendment, Applicants maintain that claim 30 is no longer indefinite and respectfully request the withdrawal of the rejection of claim 30 under 35 U.S.C. § 112, second paragraph.

First 35 U.S.C. § 102(a) Rejection

The Examiner rejects claim 29 under 35 U.S.C. § 102(a) as being anticipated by Wunning, U.S. Patent No. 5,452,882 (hereinafter "Wunning").

Claim 29 has been cancelled. In view of this cancellation, this rejection is no longer relevant.

Second 35 U.S.C. § 102(a) Rejection

The Examiner rejects claims 16 to 17, 22, 24 and 30 to 31 under 35 U.S.C. § 102(a) as being anticipated by Stratton, WO Patent Publication 02/44430 (hereinafter "Stratton"). This rejection is respectfully traversed with regard to claims 16 to 17, 22, 24 and 30 to 31, as amended.

Applicants maintain that claims 16 to 17, 22, 24 and 30 to 31 are not anticipated by Stratton since Stratton teaches a method of quenching a hot metal object utilizing a hot gas stream that comprises at least 20% by weight of hydrogen, from 40 to 60% by volume of nitrogen, from 12 to 20% by weight of carbon monoxide, and smaller amount of other gases such as methane, water vapour and carbon dioxide. Claims 30 and 31, from which claims 16 to 17, 22, 24 and 30 to 31 depend either directly or indirectly, provide for a method for rapidly cooling metal parts using a pressurized cooling gas mixture that includes one or a plurality of gases selected from saturated hydrocarbons, unsaturated hydrocarbons, CO₂, CO, H₂O, NH₃, NO, N₂O, NO₂ and mixtures thereof. Nitrogen is not one of the components of the claimed cooling gas mixture. Accordingly, Applicants respectfully maintain that claims 16 to 17, 22, 24 and 30 to 31, as amended, are not anticipated by Stratton under 35 U.S.C. § 102(a) and respectfully request that this rejection be withdrawn.

First 35 U.S.C. § 103(a) Rejection

The Examiner rejects claim 25 under 35 U.S.C. § 103(a) as being unpatentable over Stratton. This rejection is respectfully traversed with regard to claim 25 on the basis that Stratton teaches against the present invention since Stratton teaches the inclusion of nitrogen as one of the components in the gas mixture.

Stratton teaches a method of quenching a hot metal object by taking a hot gas stream comprising at least 20% by volume of hydrogen, cooling the hot gas stream, compressing the hot gas stream, removing heat of compression from the compressed gas stream and passing it through a nozzle and causing it to impinge upon the hot metal object so as to quench the object. On page 3, at lines 11 to 14, Stratton provides that “[t]he hot gas may in addition contain from 40 to 60% by volume of nitrogen, from 12 to 20% by volume of carbon monoxide, with smaller amounts of other gases such as methane, water vapour, and carbon dioxide typically also being present.” Accordingly, Stratton teaches a mixture of hydrogen, nitrogen, and carbon monoxide with small amounts of methane, water vapour and carbon dioxide.

Claim 25 of the present invention depends indirectly upon claim 30 of the present invention which provides for a method for rapidly cooling metal parts using a pressurized cooling gas mixture that includes one or a plurality of gases selected from saturated hydrocarbons, unsaturated hydrocarbons, CO₂, CO, H₂O, NH₃, NO, N₂O, NO₂ and mixtures thereof. Claim 25 provides that the absorbing gas in the mixture be between 20% and 80% of the total mixture volume. While the mixture of Stratton requires the inclusion of nitrogen, the present invention does not. In fact, it is noted in the background of the present invention that “the gas most commonly used for cooling is nitrogen, because it is an inert and inexpensive gas”. The background goes on to provide that “it is known, in gas hardening systems, that the temperature must be lowered as rapidly as possible for the steel transformation to occur satisfactorily, from the austenitic phase to the martensitic phase without passing through the pearlitic and/or bainitic phases...[h]owever, it has been observed that in certain critical cases, nitrogen quench hardening installations are not suitable for obtaining a sufficient temperature lowering rate.” Accordingly, Applicants maintain that Stratton, while teaching a method for quenching a hot metal object, teaches against the present invention since Stratton teaches the inclusion of nitrogen as one of the components in the gas mixture.

In view of the above, Applicants maintain that claim 25 is not obvious in view of Stratton and accordingly, request that the rejection of this claim under 35 U.S.C. § 103(a) as being unpatentable over Stratton be withdrawn.

Second 35 U.S.C. § 103(a) Rejection

The Examiner rejects claim 19 under 35 U.S.C. § 103(a) as being unpatentable over Stratton in view of Baxter, U.S. Patent No. 5,173,124 (hereinafter "Baxter"). This rejection is respectfully traversed on the basis that Stratton teaches against the present invention since Stratton teaches the inclusion of nitrogen as one of the components in the gas mixture and Baxter does not overcome this deficiency.

The Examiner notes that Stratton does not disclose adjusting the composition of the gas mixture to optimize the mixture's convection heat transfer coefficient. The Examiner relies upon the secondary reference Baxter for this. The Examiner goes on to note that it would have been obvious to one of ordinary skill in the art to apply Baxter's step of adjusting the composition to the method of Stratton in order to optimize the quenching ability of the gas mixture.

As noted above with regard to the First 35 U.S.C. § 103(a) Rejection, Stratton teaches the quenching of a hot metal object using a mixture of hydrogen, nitrogen, and carbon monoxide with small amounts of methane, water vapour and carbon dioxide. As noted in the background of the present invention, in certain critical cases, nitrogen quench hardening installations are not suitable for obtaining a sufficient temperature lowering rate. Furthermore, as noted on page 3, lines 15 to 20, of the present application, "...one of the objects of the present invention is to provide a quench hardening installation using a cooling gas that is thermally more efficient than nitrogen and is inexpensive and simple to use, allowing the cooling of the most demanding materials." Accordingly, Stratton teaches away from the present invention since the cooling gas mixture of the present invention does not include nitrogen. Baxter does not overcome this deficiency.

In view of the above, Applicants maintain that claim 19 is not obvious when considered in view of Stratton and Baxter and accordingly, request that the rejection of this claim under 35 U.S.C. § 103(a) as being unpatentable over Stratton in combination with Baxter be withdrawn.

Third 35 U.S.C. § 103(a) Rejection

The Examiner rejects claim 28 under 35 U.S.C. § 103(a) as being unpatentable over Stratton in view of Andersson, U.S. Patent No. 5,938,866 (hereinafter "Andersson"). This

rejection is respectfully traversed on the basis that Stratton teaches against the present invention since Stratton teaches the inclusion of nitrogen as one of the components in the gas mixture and Andersson does not overcome this deficiency.

The Examiner notes that Stratton does not disclose recycling of the quenching gas. The Examiner relies upon Andersson for the recycling component of the process and notes that it would have been obvious to one of ordinary skill in the art to apply Andersson's steps of compression and purification to the method of Stratton in order to facilitate the recycling of a quenching gas thereby increasing the efficiency of the installation system. Applicant's respectfully disagree.

As noted in the previous two responses to rejections under 35 U.S.C. § 103(a) involving Stratton, Stratton teaches against the present invention since Stratton teaches the inclusion of nitrogen as one of the components in the gas mixture as discussed hereinbefore. Andersson does not overcome this deficiency.

Accordingly, Applicants maintain that claim 28 is not rendered obvious when considered in view of Stratton and Andersson. Applicants therefore request that the rejection of claim 28 under 35 U.S.C. § 103(a) as being unpatentable over Stratton in view of Andersson be withdrawn.

Fourth 35 U.S.C. § 103 Rejection

The Examiner rejects claims 16 to 17, 20 to 22, 24 to 27 and 30 under 35 U.S.C. § 103(a) as being unpatentable over Wandke, EP 0869189 (machine translation, hereinafter "Wandke") combined with Boyer, U.S. Patent No. 5,798,007 (hereinafter "Boyer") and Lemken, U.S. Patent No. 6,428,742 (hereinafter "Lemken") and Nakamura, JP 63149313 (hereinafter "Nakamura"). This rejection is respectfully traversed with regard to claims 16 to 17, 20 to 22, 24 to 27 and 30, as amended.

In the rejection, the Examiner notes that Wandke discloses a method for gas quenching metal workpieces wherein the method includes using a pressurized cooling gas mixture. The Examiner notes that one of the preferred embodiments includes carbon dioxide in addition to hydrogen, helium, or mixtures of hydrogen and helium. The Examiner goes on to note that Wandke does not disclose adjusting the composition to obtain an average mixture

density that is approximately the same as that of nitrogen. The Examiner cites Boyer for the position that quenching installations are designed for a particular quenching medium. The Examiner cites Lemken for the position that the density of the cooling gas associated therewith affecting the design and strength of the quenching installation in terms of power. Finally, the Examiner cites Nakamura for the position that coolant nitrogen gas is circulated in a closed vessel via a circulating fan. The Examiner, referencing the secondary references then provides that it would have been obvious to one of ordinary skill in the art to modify Wandke's method with the teachings of Boyer, Lemken and Nakamura by including a step adjusting the composition to obtain an average mixture density that is approximately the same as that of nitrogen in order to apply Wandke's gas mixture in a gas quenching installation designed for nitrogen.

Applicants respectfully disagree and maintain that claims 16 to 17, 20 to 22, 24 to 27 and 30 are not rendered obvious by Wandke in view of Boyer, Lemken and Nakamura since: 1) Wandke does not disclose adjusting the composition to obtain an average mixture density that is approximately the same as that of nitrogen; 2) the secondary references, while disclosing a variety of things, fail to provide for the use of a gas mixture having an average mixture density that is approximately the same as that of nitrogen; 3) there is no reasoning as to why one of ordinary skill in the art would combine the secondary references with Wandke; and finally 4) even if the references were combined, they would arguably not lead to the present invention.

Claim 30 of the present invention, from which claims 16 to 17, 20 to 22 and 24 to 27 depend either directly or indirectly, provides for a method for rapidly cooling metal parts using a pressurized cooling gas mixture. The pressurized cooling gas mixture comprises one or a plurality of infrared radiation absorbing gases selected from saturated hydrocarbons, unsaturated hydrocarbons, CO₂, CO, H₂O, NH₃, NO, N₂O, NO₂ and mixtures thereof. Claim 30 further provides that the composition of the mixture is adjusted to obtain an average mixture density that is approximately the same as that of nitrogen. As noted by the Examiner, Wandke does not disclose this.

The Examiner relies upon the combination of Boyer, Lemken and Nakamura to support a gas quenching furnace designed for the quenching gas of nitrogen where the density of nitrogen is taken into account in said design. However, Applicants maintain that the secondary references fail to provide for the use of a gas mixture having an average mixture density that is approximately the same as that of nitrogen. While Nakamura discloses the use of a coolant gas that is nitrogen, Applicants note that the coolant gas in the present application is not nitrogen—it is instead a gas mixture having an average mixture density that is approximately the same as that of nitrogen. Applicants maintain that one skilled in the art considering Wanke and the secondary references would not be led to utilize a gas mixture that has an average mixture density that is approximately the same as that of nitrogen simply because nitrogen has been used as a coolant gas previously.

Also, Applicants maintain that there is no reasoning for the combination of the three secondary references with Wandke. While each teaching specific points, there is no reason why one of ordinary skill in the art would pick and choose these specific points and combine them together with Wandke. Even if one were to pick and choose among these references, Applicants maintain that the present invention would still not be achieved since the combination of these references would not lead one to use the gas mixture claimed by Applicants having an average mixture density that is approximately the same as that of nitrogen.

In view of the above, Applicants maintain that claims 16 to 17, 20 to 22, 24 to 27, and 30 are not rendered obvious when considered in view of Wandke in combination with Boyer, Lemken and Nakamura. Accordingly, Applicants respectfully request that the rejection of these claims under 35 U.S.C. § 103(a) be withdrawn.

Fifth 35 U.S.C. § 103(a) Rejection

The Examiner rejects claim 19 under 35 U.S.C. § 103(a) as being unpatentable over Wandke and Boyer and Lemken and Nakamura in view of Baxter. This rejection is respectfully traversed.

Claim 19 depends indirectly from claim 30. Accordingly, the same arguments made with regard to the Fourth 35 U.S.C. § 103(a) Rejection as it applies to Wandke, Boyer,

Lemken and Nakamura is applicable with regard to the present rejection. Applicants maintain that Baxter does not overcome the deficiencies of the Wandke, Boyer, Lemken and Nakamura combination. Accordingly, Applicants maintain that claim 19 is patentable when considered in view of Wandke, Boyer, Lemken, Nakamura, and Baxter. Applicants therefore request the withdrawal of the rejection of claim 19 under 35 U.S.C. § 103(a).

Sixth 35 U.S.C. § 103(a) Rejection

The Examiner rejects claim 28 under 35 U.S.C. § 103(a) as being unpatentable over Wandke and Boyer and Lemken and Nakamura in view of Andersson. This rejection is respectfully traversed.

Claim 28 depends directly from claim 30. Accordingly, the same arguments made with regard to the Fourth 35 U.S.C. § 103(a) Rejection as it applies to Wandke, Boyer, Lemken and Nakamura is applicable. Applicants maintain that Andersson does not overcome the deficiencies of the Wandke, Boyer, Lemken and Nakamura. Accordingly, Applicants maintain that claim 28 is patentable when considered in view of Wandke, Boyer, Lemken, Nakamura, and Andersson combination. Applicants therefore request the withdrawal of the rejection of claim 28 under 35 U.S.C. § 103(a).

Seventh 35 U.S.C. § 103(a) Rejection

The Examiner rejects claim 31 under 35 U.S.C. § 103(a) as being unpatentable over Wandke combined with Boyer and Lemken and Nakamura. This rejection is respectfully traversed with regard to claim 31, as amended.

Applicants maintain that the same arguments made with regard to the Fourth 35 U.S.C. § 103(a) Rejection are applicable to the present rejection. Accordingly, Applicants maintain that claim 31, as amended, is patentable when considered in view of Wandke, Boyer, Lemken, and Nakamura. Applicants therefore request the withdrawal of the rejection of claim 31 under 35 U.S.C. § 103(a).


CONCLUSION

Applicants believe that claims 16 to 17, 19 to 22, 24 to 28, and 30 to 31, as amended, are now in condition for allowance. Early notice to this effect is earnestly solicited. Should the Examiner believe a telephone call would expedite the prosecution of the present application, she is invited to call the undersigned attorney at the number listed below.

Applicants do not believe that any fee other than the two month extension fee noted on page one of this response is due at this time. However, in the event that any additional fees are due, the Commissioner is authorized to debit deposit account number 01-1375 for the amount due. Also, the Commissioner is authorized to credit any overpayment with regard to the present response to deposit account number 01-1375.

Respectfully submitted,

Date: December 9, 2008


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